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Slowing the Stork: Better Health for Women Through Family Planning

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Family planning saves lives and improves the health of women through fewer births, fewer high-risk pregnancies, and fewer crudely performed abortions.

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Each year 500,000 women die from causes related to pregnancy — 99 percent of them in developing countries. While many of those pregnancies are unwanted and could have been prevented by family planning, only a minority of developing country couples use effective contraceptive methods. For some women, pregnancy represents a major health risk. Many of them are among the poorest of the poor, living in rural areas of South Asia and Sub-Saharan Africa, and have low education, high fertility, and poor health and nutritional status.

There is also a huge pool of women of lower risk who want no more children and whose health would benefit substantially from limiting the number of children they bear. In virtually all developing countries, the number of women who want no more children exceeds the number of contraceptive users. What factors determine women's use of contraceptives, and how can family planning programs reach the large numbers of women at risk from further pregnancies?

The most successful family planning policies offer women a variety of contraceptive methods tailored to specific age groups and educational levels. Community-based programs that provide a high quality of family planning services and emphasize the importance of the mother's health will increase the likelihood that these programs will reach women who are not practicing contraception at present.

The question that is always asked is, What will it cost? Much program experience suggests that family planning is one of, if not the most cost-effective means of averting maternal deaths. The savings generated by family planning services could be invested in saving the lives and health of women who do want to have more children.

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TABLE OF CONTENTS

Acknowledgments

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Family planning - conscious efforts by individuals and couples to regulate their fertility - saves lives and improves the health of women. Indeed it was to save women's lives that Margaret Sanger founded the modern family planning movement. Yet seventy years later, 500,000 women die each year from pregnancy-related causes, 99 percent of them in developing countries (WHO, 1985). Many of those pregnancies are unwanted and could be prevented by family planning.

We now have far more effective family planning methods than were available to Margaret Sanger and solid evidence that these methods are successfully employed by millions of couples in developing and developed countries alike (World Bank, 1984). But a majority of developing country couples do not use effective contraceptive methods and lack their health and other benefits. And while the essential facts remain the same, much more is now known about the impact of family planning on women's health, at different ages and stages in the family and reproductive life cycle, in different social, economic and cultural circumstances, and in relation to organized efforts to provide family planning services on a broad scale.

We will try to summarize the main facts about the effect of family planning on maternal health and to suggest how they can be translated into stronger policies and programs to save women's lives and improve their health. We will examine the following four areas:

- direct effects of family planning on maternal health through the prevention of health risks associated with pregnancy:
  - a) preventing maternal deaths; and
  - b) preventing maternal ill health.
- the health effects of fertility control - mainly the side effects, complications and health benefits of various contraceptive methods;
- the effect of organized family planning <u>programs</u> on maternal health;
- the cost-effectiveness of family planning services in preventing maternal mortality and morbidity.

We begin by saying what this paper will not cover.

We will not focus on the critical role of family planning in social and economic development. Rapid population growth inhibits overall development mainly by forcing governments and individuals to spend scarce resources on current consumption rather than investing them for future social and economic returns (World Bank, 1984). As development proceeds, fertility falls. When family planning services are made widely available and accessible, fertility falls more rapidly than would otherwise be the case, thereby slowing population growth. Slower population growth, in turn, makes possible better employment opportunities, education and health services. These opportunities and services, in turn, reduce fertility norms. Better

maternal health results from this development cycle in myriad ways. For example, female education tends to lower fertility "by delaying marriage, by increasing the effectiveness of contraceptive use, and by giving women ideas and opportunities beyond child bearing alone" (World Bank, 1984). Maternal health and nutrition improve directly as a result of lowered fertility, and indirectly as the development cycle gains another notch, which makes possible further advances in the living conditions of communities and individuals. While we will not dwell on these relationships, the contribution of family planning to maternal health that operates through overall development, clearly is of critical importance.

I. DIRECT EFFECTS OF FAMILY PLANNING ON MATERNAL HEALTH

Here we examine the direct effect of family planning in preventing maternal mortality through fewer births, fewer high risk pregnancies and fewer crudely performed abortions.

Fewer Births

The direct effect of family planning is most obvious and dramatic in relation to the reduction of fertility. If a pregnancy does not occur, obviously its health risks are averted. Fortney (1985) illustrates the impact with data from Egypt and Bali. There were 190 maternal deaths per 100,000 live births in Menoufia, Egypt, in the early 1980s, compared to 618 per 100,000 live births in Bali. This is the so-called maternal mortality rate (actually a ratio) which measures a woman's risk of dying once she is pregnant. The picture changes radically when we look at the true maternal mortality rate, i.e. the number of maternal deaths per 100,000 women of reproductive age, which measures both the rate at which women become pregnant and the risk of death once they are pregnant. This rate turns out to be 46 per 100,000 women in Egypt and 70 per 100,000 women in Bali. Bali still has the higher rate but the difference is much smaller. The difference between the two measures of maternal mortality reflects differences in the number of pregnancies in the two populations, which in turn largely reflects the use of family planning. In this case, about 50 percent of women were using contraception in Bali versus 25 percent in Menoufia, Egypt.

Maine et al (1986) used World Fertility Survey data to estimate the proportion of maternal deaths that would be prevented if all women saying they want no more children and currently not using effective contraception, were able with family planning to avoid all future births. The median proportion of deaths averted for twenty-six developing countries was 29 percent, with a range from 5 percent in Ivory Coast to 62 percent in Bangladesh. The median percentage reductions were as follows: 17 percent for 8 African countries; 35 percent for 10 Asian countries; and 33 percent for 8 Latin American countries. Two points deserve emphasis here. First, Maine et al estimate the proportion of deaths averted. The absolute number of lives saved obviously depends on the maternal mortality ratio. For many developing countries, especially those in South Asia and sub-Saharan Africa, the ratio is 400 - 1,000 maternal deaths per 100,000 live births, a level up to 100 times as high as that prevailing in Northern Europe and North

America. The second point is that unwanted births are more likely to be high risk pregnancies and/or to end in crudely performed abortion, the next topics to which we turn.

Fewer High Risk Pregnancies

It has long been known that the risks of pregnancy are higher for certain groups of women - very young women, those aged 35 or older, and women who have already borne 4 or more children (WHO, 1985). Moreover, pregnancies among these groups of women are disproportionately likely to be unwanted. In addition, there is a higher probability that an unwanted pregnancy will end in a crudely induced abortion with all its attendant risks. For all of these reasons, unwanted pregnancies account for a disproportionate share of maternal deaths. Family planning can greatly reduce maternal deaths from unwanted pregnancies; the evidence is clear.

A major reason why there are now far fewer maternal deaths in the U.S. than half a century ago is that many fewer births occur in older, higher parity women (Berry, 1977). A recent study estimated what maternal mortality would have been among some family planning clinic clients in Atlanta without contraception. Twenty-four pregnancy-related deaths would have been expected among over 30,000 women, but only 2 deaths occurred (Ory, 1984).

The potential for family planning to reduce maternal deaths is high in most developing countries because most pregnancies pose high risks for the woman (Population Reports, 1984). China has reduced substantially maternal deaths over the past forty years through improved overall living conditions (and thus better health and nutritional status of women), better obstetrical care, and widespread use of family planning and abortion services. In Shanghai, for example, the maternal mortality rate declined from 320 to 30 per 100,000 live births between 1950 and 1980 (Puqui, 1983). In rural Bangladesh, a recent study estimated that the maternal mortality ratio would decline by more than one fifth, if births were confined to women aged 20 to 39 having their first through fifth births (Trussell and Pebley, 1984).

The evidence is less clear regarding the role of closely spaced pregnancies in maternal mortality. Very high death rates have been found in Bangladesh and Indonesia, for example, among women under 20 with three or more children, in whom pregnancies must have been closely spaced. However, no studies have measured the effect of birth intervals on maternal mortality independent of age and parity (Population Reports, 1984).

Fewer Primitive Abortions

Women in all societies are more likely to have their pregnancies terminated if they are personally unwanted and/or socially proscribed. In situations where safe and legal abortion services are available, the health risks of the procedure are less than those of carrying the pregnancy to term. In the United States, for example, legal induced abortion in the first 20 weeks of pregnancy carries a lower mortality risk than childbearing (Rochat, 1986). Where safe abortion is not an option available to women, they still will seek to terminate their pregnancies by whatever means are available, in proportions varying by country, but always in substantial

proportions. Since most illegal abortions are crudely and unhygienically performed, primitive abortion is a major killer of women (WHO, 1985). In a series of studies reported by WHO, illegal induced abortion accounted for 7 - 50 percent of maternal deaths, with a median of 15 percent. Family planning services, backed up by safe abortion services in the case of contraceptive failure, have the potential to prevent all of these deaths.

Pregnancy-related Illness (Morbidity)

Here we consider the relationship between fertility control and the health of women. Section II addresses implications for health of the various contraceptive methods, as distinct from the health implications of reducing and/or spacing the number of births. Our consideration of how family planning prevents maternal ill health is limited to the health implications of having fewer and more widely spaced children.

Controlling her fertility clearly enhances a woman's opportunities for education, employment and activities other than her role as mother and homemaker. These activities outside the home may provide additional income that may be used to improve the nutrition and health of the woman. On the other hand, a woman's role outside the home may expose her to occupational hazards inimical to her health.

Pregnancy related illness (morbidity) has seldom been examined in detail and a satisfactory classification system does not exist. If one classified morbidity like mortality, then morbidity temporally associated with pregnancy would be classified as directly related, indirectly related or incidental to the pregnancy. Morbidity directly related to pregnancy, childbearing and the puerperium would include, for example, bleeding, infection, injury to the genitals, etcetera. It would also include morbidity from therapeutic actions such as transfusion-transmitted infections (e.g., AIDS), sepsis from repeated unclean vaginal examinations, anesthesia-related morbidity, and inadequate or inappropriate or untimely care within a health facility. Indirect causes might include the increased morbidity risk which an ill woman incurs as a result of becoming pregnant; for example, from anemia, heart disease, kidney disease, malaria, diabetes, etcetera, exacerbated by pregnancy. Incidental causes might include unintentional injuries, social rejection from disapproved pregnancy and pregnancy related injury, such as genital damage (fistulae) which allows feces or urine to be passed uncontrollably into the vagina.

Simple measures, such as disability and prevalence of hospitalization for pregnancy complications and their treatment show that, when hospital care is available, pregnancy and its care is one of the most common reasons for hospitalization. This is true in developed and developing countries alike. Assisted deliveries, by surgery, vacuum extraction or forceps comprise 15-50 percent of deliveries in institutions in developing countries. Infrequently measured but important would be the effects of loss of childcare and economic loss resulting from pregnancy and its complications.

Hemorrhage, pregnancy-induced hypertension (toxemia), sepsis, obstructed labor and abortion (spontaneous or induced) are the mai· direct causes of maternal death and cause most of the serious illnesses from which women survive. Unfortunately, few data are available to document the incidence and severity of morbidity in representative populations. Harrison's studies in Zaria, Northern Nigeria are an important exception providing detailed information on the patients seen in a large hospital (Harrison, 1985). Moreover, several studies have verified the common observation that many serious complications occur for every maternal death. Harrison (1987) estimates that there are at least ten major complications for each maternal death. Bhatia (1985) reported more than sixteen cases of morbidity for each death in an Indian study.

Hemorrhage from all causes is more likely to occur in older women with many children (Population Reports, 1984). By enabling women to have fewer children, family planning lowers the risk of this common and life-threatening complication. Pregnancy-induced hypertension is least common among women in their twenties having their second and third child. Family planning prevents morbidity in this case by allowing couples to avoid pregnancy at the extremes of the reproductive cycle, and by allowing them to have fewer pregnancies. Sepsis is also more common in very young women and in older women with many children, so family planning can prevent this complication in the same way (Population Reports, 1984).

Women with unwanted pregnancies at any age frequently resort to primitive induced abortion with its high risk of infection, hemorrhage and death. Those who survive may have a permanent health impairment such as chronic pelvic inflammatory disease which may result in permanent infertility. Family planning can prevent many of these unwanted pregnancies.

Family planning obviously cannot prevent obstructed labor in a woman with a severely contracted pelvis, unless she avoids pregnancy altogether. But it can reduce the incidence of life-threatening complications of this sort.

Table 1 sets forth the interventions recommended for use at the primary and first referral levels, to reduce maternal mortality and morbidity in developing countries.

Health Benefits of Fewer Children

Other things being equal, the woman who has two or three children is likely to enjoy better health than her counterpart who has seven or eight. This is even more likely to be the case for a poor woman in a developing country. The principal reason is that women work extremely hard in developing countries - in agriculture, raising livestock and small animals, carrying water, cooking, other domestic chores and childrearing. For many women in developing countries, this translates into an exhausting day of 14-16 hours work. In general, more children means more work, more fatigue and less opportunity for rest and recreation. (More children usually means less opportunity for economic and other non-domestic roles that may increase a woman's income, education or both and thereby her health). But there is

also evidence that women in some societies have more children partly to lighten their own burden. Given the heavy demands of pregnancy and lactation on the mother, one would expect that many and/or closely spaced births would result in clear evidence of impaired maternal health. We turn now to the scientific evidence.

Noting the cumulative drain of hard labor, poor diet and frequent, closely-spaced pregnancies, Jelliffe (1986) coined the term "maternal depletion syndrome" to characterize the various multi-nutritional deficiency states, for example, iron-deficiency anemia, thought to be responsible. While the end stages of this "syndrome" - a woman with many closely spaced pregnancies who is chronically fatigued, anemic and perhaps suffering from osteomalacia as a result of calcium and vitamin D deficiency - are often seen by the clinician, it has proved difficult to document with hard statistical evidence. Bernard et al (1978-79) found in an Indian study that almost 40 percent of women having their fourth or later child were anemic, compared to 21 percent having their first child. On the other hand, there was no evidence for the syndrome in four out of nine countries in the WHO Studies on Family Formation Patterns and Health (Population Reports, 1984).

A major review (Population Reports, 1984) cited three methodological problems that often obscure the relationship between maternal age, family size and birth spacing on maternal (and child) health: confounding variables, especially socioeconomic status, questions about the direction of causality, for example, deliberately shortening the birth interval to replace a lost infant, and multiple, interrelated variables. An especially difficult problem is that of disentangling the effect of poverty, as opposed to childbearing, on maternal nutrition. Regardless of the difficulties of documenting a clear-cut syndrome in population-based studies, we conclude that it is plausible to assume that high parity, especially when they are closely spaced, results in substantial maternal morbidity, other things being equal. This morbidity may range from nutritional deficiency states, to a greater likelihood of some life-threatening conditions, e.g., hemorrhage, toxemia, sepsis and abortion, and uterine prolapse. It follows that family planning - fewer and better spaced pregnancies - is likely to reduce maternal morbidity, as well as maternal mortality, and contribute importantly to the health and wellbeing of women in the childbearing years.

II. HEALTH EFFECTS OF FERTILITY CONTROL

Family planning is generally far safer than childbearing for women in developing countries, as Table 1 demonstrates. We will summarize only briefly the main health effects of contraception, since a separate paper on contraceptive safety has been prepared for the Conference. Contraceptive methods generally are safer and free from substantial risk of complications compared to other drugs and surgical procedures, as well as to childbearing (Gray, 1986). Comparisons with other drugs or common remedies are complicated, however, by the fact that individual contraceptive methods may be used for relatively long periods for preventive rather than curative effect. Antibiotics or anti-malarials, by contrast, are used episodically, usually in the presence of serious disease. Comparisons with childbearing

also must take into account the limited duration of pregnancy-related risks. In addition, most studies of contraceptives have been carried out among women from developed countries. Nevertheless, the substantial volume of studies conducted in developing countries and the far larger risks of childbearing in those countries, make clear the substantial impact of contraception in reducing both maternal morbidity and mortality. Brief summaries for each major type of contraception follow.

Combined Oral Contraceptives

Overall, from a public health perspective and for most women, combined oral contraceptives provide health benefits which exceed the health risks. The benefits include protection against pelvic inflammatory disease, ectopic pregnancy, benign breast disease and ovarian cysts (Ory, 1982). In addition, this method relieves many menstrual disorders and helps to prevent iron-deficiency anemia. According to WHO and the International Planned Parenthood Federation, combined oral contraceptives remain a safe and highly effective contraceptive method for most women.

The most important health concern about this method is that it might increase the risk of cancer. The best epidemiological evidence is that it protects against endometrial and ovarian cancer, has no effect on breast cancer and has slight, if any, effect on cervical cancer. Studies of risks of malignancy and its determinants are complicated by the importance of sexual and other behavior as determinants and the difficulty of measuring those behaviors. Other specific, but usually rare, health risks from using oral contraceptives are those of circulatory complications and a rare liver cancer. The most important way to reduce these risks is for a woman not to smoke tobacco and to use oral contraceptives only for spacing. Finally, this method may reduce the volume of breast milk and usually should not be used by lactating mothers.

Long-acting Injectables and Implants

These contraceptive methods do not contain the estrogen in combined oral contraceptives that is thought to cause the circulatory complications (Population Reports, 1975). Injectables do not reduce breastmilk volume and in addition confer similar health benefits to those of combined oral contraceptives. Injectable contraceptives cause menstrual disturbances and may contribute thereby to iron-deficiency anemia. They have been linked to malignant tumors in laboratory animals but there is only tenuous evidence from epidemiological studies of an increased risk in humans.

The Intrauterine Device (IUD)

Overall, the IUD is an effective and relatively safe contraceptive method, especially for older women and those at any age in stable monogamous relationships. However, the IUD increases the risk of pelvic inflammatory disease, and thus the attendant risks of ectopic pregnancy and secondary infertility. This increased risk occurs at insertion and may be reduced by greater care to avoid use in infected women and by better insertion technique. Prophylactic antibiotics at insertion are also being evaluated. The IUD should normally not be used by women who have not borne children, because of the risk of infertility. By lowering the risk of pregnancy, the IUD reduces the overall risk of ectopic pregnancy. IUDs frequently cause

increased menstrual bleeding (and therefore iron-deficiency anemia) and occasionally perforate the uterus. Unintended pregnancies with an IUD in place are more likely to result in miscarriage and septic abortion. Removal of the IUD when pregnancy occurs reduces the risk of septic abortion (Population Reports, 1984).

Barrier Methods

Condoms, spermicides and diaphragms generally are without serious health risk to the user. These methods provide protection against sexually transmitted diseases, pelvic inflammatory disease and cervical cancer. They occasionally cause minor local irritation. Otherwise, the main health risks are those of pregnancy, since these methods have a higher failure rate than oral contraceptives or the IUD.

Natural Family Planning

The chief benefit of periodic abstinence (the "rhythm method") can be as a tool for sex education. A few couples can, with extensive training, use this method successfully. But for the majority, the failure rate is unacceptably high. It represents a useful alternative for couples with side effects or religious objections to other methods. However, the low acceptance and high training costs make it expensive.

Sterilization

Severe or long-lasting complications of male sterilization (vasectomy) are quite rare, and mortality occurs very rarely and only with poor surgical technique (Grimes, 1982). Female sterilization (tubal ligation) also has a very low risk of severe complications or death, and is far safer than childbearing, especially for older women and/or those of high parity, or those with other risk factors which make pregnancy especially dangerous. Sterilization is a highly appropriate method for couples who want no more children, or in those cases where the woman's health status makes another pregnancy life-threatening. As with decisions about other major life events, a small but significant proportion of women will become dissatisfied with their decision to use this method. The likelihood of dissatisfaction increases when the woman is unduly influenced by others or makes the decision at a very young age.

Induced Abortion

Abortion, especially carried out by well trained personnel in the first trimester by the suction method, is far safer than childbearing, and carries a relatively low risk of serious morbidity and mortality (Tietze, 1983; Rochat, 1986). Crudely induced abortion is an extremely dangerous method of fertility control, especially after the first trimester.

Conclusion

Overall, fertility control can significantly improve the health of women, especially poor women in developing countries, where pregnancy complications often account for more than one quarter of all deaths to women in the reproductive age group. Although many contraceptive methods have the potential to impair the health of women, and several (oral contraceptives, the IUD, sterilization) can result in fatal complications, most are also associated with substantial non-contraceptive health benefits. Except in

rare cases, (a female heavy smoker over age 35), however, the mortality risks of contraception are substantially lower than those of childbearing in developed and especially in developing countries. Moreover, the risks associated with contraceptive use can be further reduced by judicious choice of, and switching between, contraceptive methods.

III. IMPACT OF ORGANIZED FAMILY PLANNING PROGRAMS ON MATERNAL HEALTH

Here we attempt to summarize what is known about the actual and potential impact on maternal health of organized family planning programs, and the implications of that knowledge for policy and for programs.

If all women saying they want no more children and currently not using effective contraception, were able with family planning to avoid all future births, about a quarter of all maternal deaths would be prevented (Maine et al, 1987). For every death prevented, at least ten women would avoid serious health impairment from pregnancy-related illness and complications (Harrison, 1987). But what do we know of the actual impact of family planning use on maternal health? And what are the program implications of what we know, in other words, how can we narrow the gap between the potential and actual contribution of family planning? Data from the 61 countries which have conducted World Fertility Surveys (WFS) and Contraceptive Prevalence Surveys (CPS) in the last decade or so provide important clues to these questions (Population Reports, 1985). We turn now to a consideration of the main characteristics affecting use of contraception, focusing mainly on the woman, and the extent to which users belong to those groups most at risk from pregnancy.

Acceptor Characteristics

There are three main groups of clients for family planning services: those seeking to delay the first pregnancy; those wishing to space children ("spacers"); and those who wish to prevent additional pregnancies ("limiters"). Overall, there are more "limiters" than "spacers" in developing countries. WFS/CPS data demonstrate that about one quarter of contraceptive users in Asia were "spacers" versus about one-third in Latin America and the Middle East. In Africa, however, three-quarters of the relatively small number of users were "spacers" (Population Reports, 1985).

Age. Current use of contraception is highest among women aged 30-39 (Population Reports, 1985) and is lower among women in their forties and twenties. The differentials are relatively small, however. In 16 selected developing countries in the mid- to late-seventies, prevalence rates were 37, 47, 51, 48 and 48 for the 5-year age groups between 20 and 44 years of age (Population Encyclopedia, 1982). (No African country was included in this analysis). Use is least common among the youngest women, increases during the middle to late childbearing years, and then declines among the oldest women (Population Reports, 1985). Women aged 40-44 are less likely to use contraception than younger women, especially in Latin America. On the positive side, family planning programs are reaching many women in their thirties, who generally speaking, are at greater risk than those in their

twenties. But programs do less well in reaching those women at the extremes of the childbearing years, those under 20 or over 40, for whom the risks of pregnancy are greatest.

Parity. Contraceptive use increases sharply from parity 0 to parity 3 but remains fairly steady thereafter (Population Reports, 1985). Use is more common after a woman has had 2-3 children. Age and parity obviously are closely related, but each has a strong, independent effect on contraceptive use, controlling for other variables. The implication for family planning programs is clear: improve performance in reaching women at the beginning and end of the reproductive period. Women who have not yet had a child are more likely to be unmarried and young, and therefore more likely both to seek abortion and/or compromise their life opportunities through early childbearing. Higher parity women (those with four or more live births) face higher health risks from pregnancy than women with fewer children and therefore represent a high priority target group for family planning programs.

Education. Demand for family planning tends to be low where educational levels are low and mortality is high (Population Encyclopedia, 1982). Family planning programs were least effective from the seventies to the early eighties where female educational levels were low. The effect of education on contraceptive use tends to be somewhat less in the case of strong family planning programs, e.g. Indonesia, South Korea, Sri Lanka. Education of the male spouse or partner also results in higher use of contraception (Population Encyclopedia, 1982).

Residence. Urban dwellers are more likely than rural inhabitants to practice family planning. Part, but not all, of this relates to higher educational attainment among urban dwellers. The differential can be dramatic, as in Syria in the late seventies where prevalence was 34 percent in urban areas versus 5 percent in rural areas (Population Encyclopedia, 1982). In Colombia and South Korea, however, both strong programs, rural women wanting no more children were as likely as their urban counterparts to be current users (Population Encyclopedia, 1982).

Family Planning Program Variables

Several factors related to family planning programs and their context also exert important influences on contraceptive acceptance and continued use. As expected, oral contraceptive users tend to be younger and of lower parity than IUD acceptors, who are usually lower in age and parity than sterilization acceptors. A second generalization is that there is a "fairly universal downward trend in the age and parity of acceptors" over time, (Population Encyclopedia, 1982) which relates to the stages of family planning program development. Carrasco (1981) describes three patterns of contraceptive use. In countries where programs are recently established and/or weak and relatively few women use contraception, they tend to be of relatively high age and parity. Where contraceptive prevalence is moderately high, for example, Jordan, older women are "limiters" while some younger and low-parity women, mainly in cities, are "spacers". Where prevalence is high and family planning services are readily accessible, for example, Costa Rica, "spacers" and "limiters" are roughly equal in number.

Three other findings bear on the question of how to maximize the impact of family planning programs on maternal health. First, relatively few acceptors are of extremely high or low age and parity (Population Encyclopedia, 1982). Second, community-based family planning distribution programs reach relatively young, low parity couples, when compared to clinical programs. And third, in virtually all developing countries, the number of women who want no more children exceeds the number of contraceptive users. Granted that some of these women are pregnant, breastfeeding, infertile or their husbands are away, there is still a vast pool of unmet need for family planning. In general, the reasons for not using contraception are lack of acceptable services, fear of side effects and complications, opposition of spouse or other family members, or cultural and religious objections (World Bank, 1984). What, then, are the program implications of our knowledge about acceptor characteristics and family planning program experience?

Program Implications. Two clear conclusions follow from this brief review of family planning user characteristics and program experience. First, there is nowhere near a one-to-one relationship between the need for family planning from a health standpoint and the motivation to use contraception. On the contrary, there are large numbers of women for whom pregnancy represents a major health risk who are not practicing contraception. Many of them are among the poorest of the poor, live in rural areas of South Asia and sub-Saharan Africa, have low education, high fertility and poor health and nutritional status. Another large group at high risk is young women in their teens, unmarried or married before they have reached full womanhood, for whom pregnancy represents a major threat to their life chances, their health and their survival. Second, there is a huge pool of unmet need for family planning services among women of lower risk, all of whom want no more children now, or no more children ever, whose health would benefit substantially from spacing or limiting their fertility. Action on three fronts is needed to meet the needs of these two groups of women: segmenting the market for family planning services; improving the quality of family planning services; and emphasizing the health benefits of family planning.

Segmenting the Market. Different approaches are needed to cater to the family planning needs of different segments of the population. For example, the needs of adolescent women, postpartum women and women with young children are different in terms of their level of motivation, method choice and mode of service delivery. Adolescent women are often hard to reach, unmotivated to use contraception and need a relatively small range of methods, for example, oral contraceptives and condoms. Their needs may be met best through social marketing, the private sector and with special outreach efforts tailored to their lifestyle. Postpartum women, on the other hand, are usually highly motivated to practice family planning, need a wider method choice for spacing and limiting, and are more likely to continue with a method. Where births are institutionalized, these women's needs can be met cost-effectively in institution-based programs. Too often, unfortunately, the effectiveness of postpartum programs has been forgotten with the advent of equally cost-effective, community-based programs. The

mother with young children is often best served through a health-based program, whether community-based or clinical, but social marketing and private sector services also will be highly appropriate for some of these women. Two basic program principles emerge. First, segment the market for contraception, use service delivery strategies that match the needs of each group, and offer all groups multiple channels for obtaining family planning services. Second, target those women most at risk from pregnancy-related complications for special attention in educational messages, outreach and follow-up.

Improving the Quality of Family Planning Services. Reaching those women most at risk from the complications of pregnancy, will require the provision of high quality family planning services. Quality is mainly a function of availability and acceptability of services, wide choice of methods, friendly, courteous and compassionate relations with clients, and careful follow-up. Experience with national family planning programs during the past two decades amply demonstrates the importance of quality to both acceptance and continuation of use of contraception. Quality is even more critical for the hard-to-reach groups, such as the unmarried teenager, or the older, high parity rural dweller with little education, who are most at risk of pregnancy-related morbidity and mortality.

Emphasizing the Health Benefits of Family Planning. Health and family planning service providers usually emphasize health benefits in speaking of family planning. But in program operations these considerations are at times overlooked, for understandable reasons. For example, there is a natural tendency to recruit the most highly motivated clients, who frequently are not those for whom the health benefits will be greatest. Moreover, reward systems for family planning workers sometimes emphasize recruiting new acceptors over encouraging continued use of contraception. This may lead to a concern with numbers of acceptors which again may de-emphasize the health benefits. And there is some tension, at least in the short run, between the demographic and health objectives of family planning programs. There is increasing recognition, however, that emphasizing the health benefits is important in the longer term for both the performance of the family planning effort, as well as for the overall development effort (World Bank, 1984).

Family planning and other development efforts work best in concert, when economic growth, gains in education, increased life expectancy and family planning effects are mutually reinforcing (World Bank, 1984). In addition, the health benefits of family planning provide a strong rationale for government, NGO and private action, a powerful motivating factor for health and family planning personnel, and most important of all, a fundamental reason why men and women seek to control their fertility. Maintaining the health of the mother, with all that implies for the survival and development of her other children, born or unborn, is perhaps the most compelling reason for contraceptive use. This is because saving the life and preserving the health of a mother confers a triple benefit: it assures the mother's continued economic and welfare contribution to the family and society; it protects the life and health of the child who is born later, whose prospects are closely linked to the survival and health of its mother;

and it greatly increases the prospects for survival and development of her living children.

IV. COST-EFFECTIVENESS OF FAMILY PLANNING SERVICES IN PREVENTING MATERNAL MORTALITY AND MORBIDITY

Family planning services appear to compare favorably from the standpoint of cost-effectiveness, with other means of preventing mortality and ill health in women in their childbearing years. To our knowledge, the cost-effectiveness of family planning services in improving maternal health has not been measured directly from actual country program data. In the absence of such empirical data, estimates depend on assumptions regarding fertility, contraceptive use, and the cost of delivering health and planning services in a given setting. A recent study attempted such estimates.

Herz and Measham (1987) estimated the cost of averting maternal deaths by taking two hypothetical populations drawing data from Asia and sub-Saharan Africa and calculated the cost of maternal health and family planning programs from estimates of their constituent parts (personnel, equipment, supplies, etcetera), again using composite data from several countries. The results are summarized in tables 3-6. Table 3 sets forth the demographic, economic and health infrastructure characteristics of two hypothetical districts in which "Safe Motherhood" programs are to be mounted. Tables 4 and 5 give the costs of the two illustrative programs, one a "moderate" program effort, the other a more limited effort. And table 6 provides the estimated cost and impact of the two illustrative programs.

The Herz/Measham estimates are for the incremental capital and recurrent costs of a maternal health and family planning program in the hypothesized settings. The cost per maternal death averted is US$4,800 and US$6,250, respectively, for the illustrative programs. The more limited effort appears more cost-effective mainly because it is usually easier and less costly to reduce mortality from a very high level to a slightly lower level, than to achieve equal reductions at lower levels of mortality. We assume, conservatively, that the cost of averting one maternal death through family planning services is no more (or less) than the cost of averting a maternal death through the non-family planning elements of the "Safe Motherhood" program. This assumption is supported by results of four illustrations of the model set out in Annex 1 of the referenced paper (Herz and Measham, 1987). The main point is that, while no hard empirical evidence is available, much program experience suggests that family planning is one of, if not the, most cost-effective means of averting maternal deaths.

Another crude way of estimating the cost of averting maternal deaths by family planning services is applying the standard couple-year of protection concept regarding contraception (Gorosh and Wolfers, 1979). It costs on average, US$20 per year to provide contraceptive protection to a woman (World Bank, 1984). If each year of protection prevents 0.4 births, on average, and if the maternal mortality rate (ratio) is 800 per 100,000 live

births, it will cost US$20 x 125/0.4, or US$6,250, to avert one maternal death.

The roughness of these estimates of the cost of averting maternal deaths deserves emphasis. The validity of the estimates depends critically on the assumptions used in the hypothetical illustrations. Of greater interest than the actual estimates is the fact that similar levels result from two quite different methodologies, which increases the plausibility of the results. And the order of magnitude of the cost of preventing a maternal death, which is a relatively rare event even in developing countries, is not high given the likelihood that the cost of preventing an infant or child death is several hundred dollars, and the cost of preventing an adult death from other causes is likely to be several thousand dollars (please see below). Finally, there is a pressing need for more research into the cost-effectiveness of alternative means of averting maternal (and other) deaths in developing countries.

The cost of preventing a maternal death, whether by family planning or other means, seems high when compared to that of saving an infant and child, which for an infant is about US$700 in developing countries (Walsh and Warren, 1979). The main reason for the lower cost of preventing child deaths is their larger number, which produces economies of scale in health programs. Preventing adult deaths from other causes is also relatively costly. For example, the estimated cost per death averted from cancer of the cervix by a screening program is US$501,000 in the U.S. (Barnes, 1981). Data from developing countries are scarce and show costs ranging from US$250 per malaria death averted (Walsh and Warren, 1979), to several hundreds of dollars per person effectively treated and several thousand dollars per death averted, for tuberculosis in Botswana (Barnum, 1986).

The cost-effectiveness of family planning, as well as other interventions, is greatly increased by the fact that for every death averted, at least ten women are saved from serious and often permanent health impairment. Moreover, when a woman dies from pregnancy-related causes, the loss is triple: her productivity and other contributions to society are lost, the infant usually dies (Chen, 1974), and the survival prospects of her other children are reduced substantially. We conclude that family planning is a cost-effective means of protecting women's health and lives.

A final, critical question for policymakers is whether the benefits of providing organized family planning services exceed the costs, both in the medium and the long term. The evidence clearly shows that benefits exceed costs in the long term (World Bank, 1984). A recent analysis of actual family planning program expenditures by the Mexican Social Security Institute (IMSS) provides impressive evidence of savings in the medium term (Nortman, Halvas and Rabago, 1986). Net savings (benefit minus cost) to IMSS began in year four of the program, and by years eleven and twelve (1982 and 1983) had reached a high of eleven pesos (in constant 1983 pesos) saved for every peso spent. "A savings in maternal and child care expenditures of 45 billion pesos, or 8.5 percent of the 1984 budget, was thus available for other IMSS services" (Nortman et al, 1986). In the many countries where

maternal mortality is high and maternal health services are weak (WHO, 1985), the savings generated by family planning services could be invested in saving the lives and health of women who do want to have children. Instead of a zero-sum game, family planning services can help women to have the number of children when they wish; safeguard their health and their lives; and generate savings to provide badly needed maternal health care. It would be difficult to find more compelling reasons to provide family planning services to the many women in developing countries who are denied them.

Table 1. SELECTED INTERVENTIONS AT PRIMARY* AND FIRST REFERRAL LEVELS TO REDUCE MATERNAL MORTALITY AND MORBIDITY IN DEVELOPING COUNTRIES**

Cause of Maternal Mortality/ Morbidity	Intervention	Health System Level
ALL	Family Planning	Primary & 1st referral
	Prenatal care	Primary
	Supervised delivery	Primary
HEMORRHAGE (before, during or after delivery	Risk screening/referral	Primary
	Other prenatal care, including treatment of anemia (diet, iron/folate, anti-malarials)	Primary
	Oxytocics when placenta delivered***	Primary
	Intravenous fluids	Primary
	Transportation to 1st referral level	Primary
	Manual removal of placenta***	Primary
	Blood typing of donors	1st referral
	Blood transfusion	1st referral
SEPSIS	Risk screening/referral	Primary
	Tetanus toxoid immunization	Primary
	Clean delivery	Primary
	Antibiotics when membranes ruptured if not delivered within 12 hours***	Primary
	Transportation to 1st referral level	Primary
	Hysterectomy	1st referral
TOXEMIA	Monitor symptoms, blood pressure and urine (for protein)	Primary
	Bed rest/sedatives	Primary
	Transportation to 1st referral level	Primary
	Induction or caesarean section	1st referral
COMPLICATIONS OF ABORTION	Antibiotics***	Primary
	Transportation	Primary
	Oxytocics	Primary
	Evacuation	1st referral
	Hysterectomy	1st referral
OBSTRUCTED LABOR (including ruptured uterus)	Risk screening/referral	Primary
	Partogram	Primary
	Transportation to 1st referral level	Primary
	Symphysiotomy	1st referral
	Caesarean section	1st referral

* Primary level includes outreach programs, and health dispensaries, posts or centers.

** 1st referral level would usually be a district or cottage hospital with 20 beds or more, with capability for blood transfusion and caesarean sections.

*** Recommended experimental approaches at community level

Source: Herz and Measham, 1987.

Table 2. RISKS OF CHILDBEARING VERSUS FAMILY PLANNING

	Estimated Annual Deaths per 100,000 women			
	Developed Countries		Developing Countries	
	Age <35	Age 35+	Age <35	Age 35+
Maternal deaths with no contraception	10	27	60	160
Deaths from side effects of oral contraceptives among nonsmokers	1	23	1	23
Deaths from side effects of oral contraceptives among smokers	7	85	7	85
Deaths from side effects of IUDs	1	2	2	4
Deaths from "side effects" of condoms	0	0	0	0

Source: Population Reports, 1984.

Table 3. DEMOGRAPHIC AND HEALTH SERVICE INFRASTRUCTURE FOR TWO ILLUSTRATIVE SAFE MOTHERHOOD PROGRAMS (US$)

	Firstland District - Moderate Effort in Poor Rural Area	Mountainland & Waterland Districts - More Limited Effort in Poorer Areas
Population	200,000	1,000,000
Per capita income	$350	$180
Crude birth rate	45/1,000 live births	50/1,000 live births
Maternal mortality rate	800/100,000 live births	1000/100,000 live births
Infant mortality rate	100/1,000 live births	200/1,000 live births
Life expectancy at birth	55 years	50 years
Contraceptive prevalence rate	10%	1-2%
Hospitals	1 50-bed	-
Health Centers	3 (1 with 2 beds)	2 (Waterland district) 4 (Mountainland district)
Health posts	10	10 (Waterland district) 0 (Mountainland district)
Mobile unit	-	1 (Waterland district)
Ministry of Health 10-year targets		
Maternal mortality rate	Reduce by 25% in 5 years and 66% in 10 years	Reduce by 10% in 5 years and 20% in 10 years
Contraceptive prevalence	Increase from 10% to 35% in 5 years and 40% in 10 years	Increase to 10% in 5 years and 16% in 10 years
Institutional deliveries	Increase from 10% to 25% in 5 years and 50% in 10 years, giving priority to high risk cases	

Source: Herz and Measham, 1987.

Table 4. SAFE MOTHERHOOD INITIATIVE, MODERATE EFFORT MODEL: SUMMARY OF ADDITIONAL ANNUAL OPERATING AND CAPITAL COSTS FOR MATERNAL HEALTH AND FAMILY PLANNING SERVICES
District of 200,000 population
(US$)

Annual Operating Costs	
Staff	$115,000
Transport	25,000
In-service training and supervision	30,000
Equipment and supplies	60,000
Health education	10,000
Monitoring and evaluation	10,000
TOTAL	$250,000
Annual operating cost per capita	$1.25
Capital Costs	
Training	160,000
Construction and upgrading	720,000
Vehicles	120,000
TOTAL	$1,000,000
Assuming 50% of capital costs attributable to maternal health & family planning;	$500,000
Annualized capital cost (10-year depreciation)	$ 50,000
Annualized cost per capita	$0.25
ANNUALIZED CAPITAL TOTAL COSTS*	$300,000
ANNUALIZED TOTAL COST per capita	$1.50

* Annual operating plus annualized capital costs.

Source: Herz and Measham, 1987.

Table 5. SAFE MOTHERHOOD INITIATIVE: MORE LIMITED EFFORT MODEL: SUMMARY OF ADDITIONAL ANNUAL OPERATING AND CAPITAL COSTS FOR MATERNAL HEALTH AND FAMILY PLANNING SERVICES
District of 1,000,000 population
(US$)

Annual Operating Costs	
Staff	$150,000
Transport	100,000
In-service training & supervision	50,000
Equipment and supplies	75,000
Health education	25,000
Monitoring and evaluation	20,000
Contingencies	30,000
Total Annual Operating Costs	$450,000
Annual operating cost per capita	$0.45
Capital Costs	
Training	100,000
Construction and upgrading	340,000
Vehicles	160,000
TOTAL	$600,000
Assuming 50% of capital costs attributable to maternal health & family planning;	$300,000
Annualized capital cost (10-year depreciation)	$ 30,000
Annualized cost per capita	$0.03
ANNUALIZED TOTAL COSTS*	$480,000
ANNUALIZED TOTAL COST per capita	$0.48

* Annual operating plus annualized capital costs.

Source: Herz and Measham, 1987.

Table 6. ESTIMATED COST AND IMPACT OF ILLUSTRATIVE SAFE MOTHERHOOD PROGRAMS* (US$)

	Moderate Effort		More limited effort	
	Before	After	Before	After
Population	200,000	200,000	200,000	200,000
Births	9,000	6,000	10,000	8,400
Contraceptive Prevalence Rate (CPR)**	9	40	(0)	16
Birth Rate	45	30	50	42
Maternal Deaths (D_m)	72	24	100	80
Maternal Mortality Rate (MMR)** per 100,000 live births	800	400	1,000	950
Percent Maternal Deaths Averted	n.a.	67	n.a.	20
Number Maternal Deaths Averted	n.a.	48	n.a.	20
Number Births Averted	n.a.	3,000	n.a.	1,600
Total Program Cost	-	$300,000	-	$96,000
Cost per Capita	-	$1.50	-	$0.48
Cost per Birth	-	$50	-	$11
Cost per Maternal Death Averted	-	$6,250	-	$4,800
Cost per Death Averted	-	$3,125	-	$2,400
Cost per Birth Averted	-	$100	-	$60

* For a district of 200,000 people in both cases.

** Set parametrically, these variables determine the number and percentage of maternal deaths averted according to the following equations: D_m = CBR x POP x MMR (where the MMR is expressed per thousand live births) and CBR = 50 - .5 CBR.

Source: Herz and Measham, 1987.

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